

### **REMARKS/ARGUMENTS**

Claim 1-19 are pending in the application. Claims 1-4, 6-8 and 11-14 stand rejected; Claims 5, 9, 10 and 15-19 are objected to and have been indicated as being allowable if rewritten in independent form.

Claims 1-3 and 11 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Tang et al., U.S. Patent No. 5,750,270 (hereinafter Tang et al.). Regarding these claims, the Examiner states that Tang et al. disclose a magnetic recording medium having a substrate (referencing Figure 1, layer 30), a magnetic layer (referring to Applicant's "interlayer" and referencing layer 31 and col. 9, lines 9-21) and a layer of magnetic recording material thereon, the magnetic recording material comprising a plurality of bilayers having Cobalt or a Cobalt alloy according to claim 11 and a noble metal, such as Pt or Pd (layers 34 and 35 and col. 9, line 44 through col. 10, line 15).

Similarly, Claims 1-3 and 11 are also rejected under 35 U.S.C. § 102(e) as being anticipated by Ikeda et al., U.S. Patent No. 6,468,670 B1 (hereinafter Ikeda et al.). The Examiner has stated that Ikeda et al. disclose a magnetic recording medium having a substrate (referencing Figure 1, "substrate"), a magnetic layer (Applicant's interlayer, and referencing Col. 2, line 7-15 "CoCr Granular Layer"), and a layer of magnetic recording material thereon, the magnetic recording material comprising a plurality of bilayers having Cobalt or a Cobalt alloy according to claim 11 and a noble metal, such as Pt or Pd (referencing Col. 3, lines 17-20 and Col. 5, lines 17-20 "Co/Pt Multilayer").

Claim 1 has been amended to include a limitation originally recited in dependent Claim 4, that the magnetic recording material comprises an initial paramagnetic layer and a final recording layer.

With respect to the present the CoCrRu granular seedlayer as described and claimed herein is not ferro- or antiferro-magnetic, but paramagnetic, conventionally referred to as non-magnetic. In other words, the magnetic anisotropy energy,  $K_u$ , of the Cobalt alloy granular seedlayer of the present invention is zero. In contrast, with the prior art cited by the Examiner, the CoCr X-type granular + Co/Pt multilayer, where the magnetic layer consists of laminated layers of different anisotropy energy ( $K_u$ ) but  $K_u$  cannot be zero. The purpose of these prior art structures is in the control of magnetic exchange coupling among the granular magnetic grains in the medium, but still allowing for such exchange coupling (i.e.  $K_u > 0$ ). The non-magnetic Cobalt alloy of the present invention does not serve this purpose and is claimed to be paramagnetic.

Further, in Tang et al. Layer 32 is utilized for determining crystallographic orientation in the multilayer (Layers 34 and 35). For the Co/Pt and Co/Pd multilayer systems, Layer 32 is either Pt or Pd, respectively. Layer 32, however, does not serve as a template for the columnar grain structure in the multilayer, because inducing granularity in Layer 32 degrades the ability of the crystallographic orientation determination.

Further, with respect to Suzuki et al. the Examiner's is drawn to other parts of the specification intermediate of those specifically referenced by the Examiner. The full disclosure of Suzuki, et al. goes on to maintain that the "paramagnetic intermediate layer" is a mainly paramagnetic layer, and is specifically stated as such in independent Claims 2, 8 and 9. Further, in Col. 3, lines 13-16 it states, "the paramagnetic intermediate layer described above has not

necessarily to be formed as a continuous layer. Isolated islands of the intermediate layer can also be used to achieve the same purpose as described above." Hence, the purpose is the control of magnetic exchange coupling of the magnetic layers ( $K_u > 0$ ), not to comprise a paramagnetic layer as described and claimed in the present invention ( $K_u \sim 0$ ). Thus, Suzuki et al. teaches away from the present invention wherein the ferro-magnetic layer has anisotropy energy of zero, thus preventing exchange coupling between the magnetic layers.

Suzuki et al. talk about reducing the interaction between the ferro-magnetic layers (see Col. 4, lines 10-28), but is desirous to still have such interaction. Further, at Col. 12, lines 30-41 it is stated that in one of the examples that a disk was cut and examined after it was formed and showed that the intermediate mainly paramagnetic layers did not have perfect conformity and that some island regions or separated regions were observed and thus the lower magnetic Layer 53 were partially in contact with the upper magnetic Layers 55 and 75. Thus, it is desired in Suzuki et al. that there be some interaction between the magnetic layers across the "mainly paramagnetic layer" of Suzuki et al. Hence, Suzuki et al. teaches away from the teachings of the present invention. Thus, it is respectfully submitted that the claims, as amended, are allowable over the prior art of record.

With respect to the present invention, it may be more properly stated the graded multilayer is more precisely in a "super paramagnetic" state. The multilayer is generally understood as "ferromagnetic," however it behaves paramagnetically when the dimension becomes too small to sustain the ferromagnetic coupling in the material. Either when the magnetic cluster volume is too small, or the Co (or Co alloy) layer thickness is too thin in multilayer structure, the ferromagnetic coupling, and also the magnetic state, are easily disturbed

by thermal agitation. This state is referred to as the "super paramagnetic limit." The graded multilayer of the present invention has an anisotropy energy of zero ( $K_u \sim 0$ ). As stated in paragraph 0020 on page 6 of the present invention, the layers are exchanged decoupled.

Claims 4, 6-8, 13 and 14 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Tang et al. as applied above, and further in view of Suzuki et al., U.S. Patent No. 5,587,235 (Suzuki et al.) and Soeya et al., U.S. Patent No. 5,726,838 (Soeya et al.).

Regarding Claims 4, 13 and 14, the Examiner relies on Tang et al. as set forth above. The Examiner recognizes, however, that Tang et al. fail to disclose an initial paramagnetic layer between the soft magnetic layer and the plurality of bilayers of Cobalt and a noble metal. However, the Examiner has held that Suzuki et al. teach that it is known in the art that providing a paramagnetic intermediate layer between two adjacent magnet layers makes it possible to reduce the medium noise during recording/reproducing operations (referencing Col. 2, lines 18-22; Col. 2, line 53 through Col. 3, line 38; and Col. 3, line 60 through Col. 4, line 9). The Examiner has held therefore that it would have been obvious to one of ordinary skill in the art at the time of the Applicant's invention to modify the device of Tang et al. to include a paramagnetic intermediate layer between the two adjacent magnetic layers as taught by Suzuki et al. since such a paramagnetic intermediate layer makes it possible to reduce the medium noise during recording/reproducing operations.

The Examiner has rejected Claim 14 based on the interpretation of the term "graded" as understood by the Examiner based on a portion of Applicant's disclosure. The Examiner references paragraph 10 to state that "graded" in Claim 14 has been interpreted to mean "this initial film is paramagnetic at room temperature and does not exchange link neighboring grains."

Applicant respectfully disagrees with the Examiner's interpretation of the term "graded." The Examiner has improperly read into the claim as a limitation a phrase appearing in the specification to state that the term "graded" means "does not exchange link adjacent grains" and is a functional limitation of the term "graded." The Examiner then states that this limitation is found in the prior art since the Examiner has held that the "prior art intermediate layer is substantially identical in composition and/or structure." The Examiner states as a basis for this assertion that both the claimed and prior art layers are paramagnetic and the Examiner has noted that exchange coupling forces are only associated with adjacent ferro/ferri-magnetic grains/materials, not paramagnetic or magnetic grains/materials. (Referencing Soeya et al., Col. 13, lines 3-7 and Col. 16, lines 31-37.) The Examiner has held that since the layer is paramagnetic and ferro/ferri-magnetic, that the layer would not possess exchange linking/coupling forces between adjacent grains or layers. Again the Examiner has read into the claim specific interpretation in order to find that the prior art reads on the claim as filed. It is respectfully submitted that the Examiner has defined the term "graded" narrowly such that the prior art reads on the claim as originally filed. For example, the *Merriam-Webster Online* defines the term "graded" as "to arrange in steps or degrees, to arrange in a series or according to a scale; to gradiate; to gradate."

Main Entry: <sup>2</sup>**grade**

Function: *verb*

Inflected Form(s): **grad·ed**; **grad·ing**

Date: 1659

*transitive senses*

**1 a** : to arrange in grades : **SORT** **b** : to arrange in a scale or series **c** : to assign to a grade or assign a grade to

**2** : to level off to a smooth horizontal or sloping surface

*intransitive senses*

**1 a** : to form a series **b** : **BLEND**

**2** : to be of a particular grade

- **gradable** ☐/'grA-d&-b&l/ *adjective*

---

Function: *noun*

Text: **1**

**Synonyms** DEGREE 1, notch, rung, stage, step

**2**

**Synonyms** ESTATE 2, rank

**3**

**Synonyms** CLASS 1, category, group, grouping, league, pigeonhole, tier

**4**

**Synonyms** QUALITY 3, caliber, class

**5**

**Synonyms** SLOPE, gradient, inclination, incline, lean, leaning, slant, tilt

Claim 15 as originally filed further defines what the graded magnetic material comprises. The portion of the specification cited by the Examiner merely states that "the initial growth region is graded, such that this initial film is paramagnetic at room temperature and does not exchange link neighboring grains. Ideally, the graded region has identical structure to the subsequent magnetic multilayer." While this language does refer to the properties that the "graded magnetic recording material" has, it does not so narrowly define the term "graded" as specified by the Examiner. It is respectfully submitted that the Examiner has engaged in hindsight reconstruction of the invention by so narrowly interpreting the claim limitation so as to read on the prior art, reading a limitation into a claim term which does not appear in that claim.

Regarding Claims 6-8, the Examiner has held that Tang et al. disclose Cobalt and noble metal bilayers meeting Applicant's claimed thickness and lamination number limitations (citing

Col. 9, line 64 through Col. 10, line 24, and exempld). Based on the remarks above, this rejection is respectfully traversed.

Claim 12 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Ikeda et al. as applied above, and further in view of Takano et al. (J. App. Phys., 87(9), 2000, 6364-6366). The Examiner relies on Ikeda et al. as set forth above in the § 102 rejection, but admits that Ikeda et al. fail to disclose a CoCr<sub>40</sub> alloy. The Examiner has stated, however, that Takano et al. teach that the amount of chromium in a {CoCr/Pt}<sub>n</sub> multilayer can be varied from 0 to 60% to effect the Kerr rotation angle and magnetic properties (referring to Figure 3 and Section III). Therefore, the Examiner deemed it to be obvious to one having ordinary skill in the art to determine an amount of Cr in a CoCr alloy meeting applicant's claimed composition limitation by optimizing the results effective variable through routine experimentation. Based on the amendment to Claim 1, from which Claim 12 depends, this rejection is respectfully traversed.

Claim 14 has also been amended to further define the graded magnetic recording material including alternating layers of initial paramagnetic layer and a perpendicular recording material. It is respectfully submitted that none of the prior art of record, either alone or in combination, teach the magnetic recording material having the layers as described and claimed herein.

Based on the foregoing, a favorable action allowing the application, as amended, is respectfully requested. It is respectfully submitted that none of the prior art references, either alone or in combination, describe or claim the paramagnetic layers, in combination with the recording disk medium, as described and claimed in the present application. The Examiner is

invited to call the undersigned if it is believed that such a conference would be of value in expediting allowance of this application.

Respectfully submitted,



Michael G. Panian  
Registration No. 32,623  
BUCHANAN INGERSOLL, P.C.  
One Oxford Centre  
301 Grant Street  
Pittsburgh, Pennsylvania 15219-1410  
(412) 562-3743

Dated: December 17, 2003

Attorney for Applicant